3.2 Groundwater Quality

3.2.1 Existing Conditions

Nitrate contamination is present in the Sumas-Abbotsford aquifer as a result of historic and ongoing land use practices throughout the area and in the Sumas Upland, which is located upgradient and northwest of the city of Sumas on both sides of the U.S./Canada international border. The primary sources of nitrate in the aquifer include the storage and application of barnyard manure, application of nitrogen fertilizers to crops, and the use of domestic septic systems. As shown in Figure 3.2-1, these uses are widespread in the rural area upgradient from the Sumas well fields. According to the Sumas Wellhead Protection Plan (City of Sumas 1996), raspberry farming constitutes one of the largest land uses in the area overlying the groundwater supply to the Sumas well fields. Other significant land uses in this area include other types of croplands, dairy farms and cattle raising, poultry barns, and numerous residential septic systems. All of these land uses are potential past and current sources of the nitrate contamination.

Nitrates are leached from the surface and near-surface soils primarily by precipitation and irrigation water. As this water infiltrates the soil column, it carries dissolved nitrates downward to the water-bearing sand and gravel of the Sumas-Abbotsford aquifer. As shown in Figure 3.2-2, a geologic profile drawn parallel to the southeasterly groundwater flow direction, there typically are no overlying low-permeability soil zones to impede the vertical movement of contaminants into the aquifer. Once the dissolved nitrate reaches the water table, it migrates with groundwater flow to the southeast, from the Sumas Upland toward the Sumas River Valley and the city of Sumas well fields.

Elevated concentrations of dissolved nitrates are common within the Sumas-Abbotsford aquifer, and in some areas are sufficiently high to restrict the use of the water for human consumption. However, the distribution of nitrates in the aquifer is not readily predictable. Studies by the U.S. Geological Survey (USGS 1999) indicate that nitrate concentrations in the aquifer are highly variable over time and by location, and that no long-term overall trend in nitrate concentrations can be discerned. More apparent are trends in individual wells and seasonal trends, with the highest nitrate concentrations in a given well commonly occurring in the winter and spring, when rainfall and recharge are the greatest. Monthly groundwater sampling of the city of Sumas wells for nitrates has shown divergent trends in nitrate concentrations. As shown in Figure 3.2-3, nitrate concentrations in the May Road well field have decreased slightly over the last several years, whereas the concentrations in the Sumas municipal well field have increased slightly over the same period. At the current pumping rates, the nitrate concentration in Well 3 of the May Road well field is projected to drop below the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) within about 1 year, whereas potable water from Well 3 in the Sumas municipal well field is projected to exceed the MCL within about 3 years. Also, there is considerable variability in nitrate concentrations, even within each of the well fields. For example, the nitrate concentration in Well 3 of the

Sumas municipal well field is typically 4 mg/L higher than that in Well 1, despite the fact that these wells are only 150 feet apart. This variability reveals the possibility that one well could become contaminated while others remain useful as a potable source of water.

3.2.2 Project Changes Related to Groundwater Quality

The Second Revised ASC includes two changes that would reduce potential adverse impacts of the project on groundwater quality. The more significant of these changes, which relates specifically to groundwater underlying the site, is the elimination of the 2.5-million-gallon aboveground tank that was originally proposed for storage of diesel oil as an alternative source of fuel. This change essentially eliminates the risk of a large quantity of diesel migrating to groundwater as a consequence of a potential tank rupture or of releases during refueling.

The second change that could slightly reduce potential impacts on groundwater quality is a small reduction in the amount of groundwater that would be required to operate the plant (from a maximum instantaneous rate of 849 gpm down to 802 gpm). While this change would not directly affect the groundwater quality, it could slightly reduce the potential for nitrates from upgradient sources to be drawn into the city of Sumas well fields. However, this 47-gpm reduction, compared to the total production rate of the well, would not likely yield a quantifiable difference.

3.2.3 Environmental Impacts

No significant impacts on groundwater movement, quantity, or quality at the site or vicinity are expected to occur during construction. Potential impacts are discussed further in Section 3.2.3.1 of the FEIS issued in February 2001. The remainder of this section addresses potential impacts on groundwater quality that could result from a relatively large off-site groundwater extraction that would be required to supply the project with a large continual source of operational water.

Operation of S2GF would result in a substantial increase in the amount of water that the city of Sumas currently extracts from its well fields. This essentially constant, substantially increased pumping rate could contribute to drawing nitrate-contaminated groundwater into the wells, exacerbating a problem that the city already faces – the potential for nitrates in the aquifer to contaminate its potable water supply. If the nitrate concentrations in the potable water supply were to exceed the state and federal MCL of 10 mg/L, the city would have to find another source of potable water or reduce the nitrate concentrations to acceptable levels by treatment or mixing with uncontaminated water.

Groundwater modeling and a land use survey performed for the city of Sumas' Wellhead Protection Plan (City of Sumas 1996) provides some perspective on the magnitude of the nitrate contamination problem in the Sumas area. It also provides evidence to suggest that increased pumping could exacerbate the problem for the city of Sumas. That

Figure 3.2-1

INSERT 11 X 17 “LAND USE WITHIN MAY ROAD AND SUMAS WELL FIELD CAPTURE ZONES”

Figure 3.2-2

INSERT 11 X 17 “GEOLOGIC PROFILE OF THE SUMAS AQUIFER”

Figure 3.2-3

document provides a comparison of the modeled capture zones for the two city of Sumas well fields under current pumping rates and under the full water right pumping rates (a condition that is not projected to be required for several years). Figure 3.2-1 shows that at the full potential pumping rates allowed by the existing water rights, the combined capture zone for the two well fields is about 7,000 feet wide and trends southeastward from the aquifer recharge zone to the well heads. In contrast, under the current actual rate of approximately 1,987 acre-feet per year, the individual capture zones have the same trend but are each about 1,000 feet wide and are separated by a gap of about 2,000 feet. Because the 1,050 acre-feet per year needed by S2GF alone would use about 80% of the remaining Sumas water rights, the increased pumping required to meet the S2GF water supply demands would draw groundwater and possibly nitrates from a considerably larger part of the upgradient area where land-use practices could result in nitrate contamination of the aquifer.

The groundwater modeling performed for the Wellhead Protection Plan also indicates that a water molecule would travel faster under the full water right pumping rate than under current conditions. Based on the modeling, the rate of travel could increase 33% in response to increased pumping, from about 1,500 feet per year to as much as about 2,000 feet per year. Consequently, pumping groundwater from the city's wells at substantially higher rates than is presently required might expedite nitrate intrusion into the well fields and draw contaminants into the wells that might otherwise not have been intercepted.

The smaller increase in the pumping rate presented in the Second Revised ASC, from a maximum instantaneous rate of 849 gpm down to 802 gpm, could slightly reduce the rate at which nitrate contamination within the Sumas-Abbotsford aquifer migrates toward the city's well fields. If nitrate concentrations were to exceed the MCL in the Sumas municipal well field, this smaller increase in the pumping rate may also provide the city with greater flexibility in how it uses water resources to meet its potable water requirements.

3.2.4 Mitigation Measures

The city of Sumas has routine procedures that it employs to protect its water supply, including regular monitoring for contaminants pursuant to the requirements of WAC 246-290-300. Because almost all of the city's wells contain nitrate concentrations that are above background levels, the city samples each well on a monthly basis for nitrates. Through its Water System Comprehensive Plan, the city has also developed contingency mitigation measures that it would employ in the event that one or more of the wells in the municipal well field were to become unusable for potable water. These measures include reallocating withdrawals from the various wells to meet use requirements, drilling new wells, seeking an additional source of water to meet contingency needs, encouraging water conservation, and curtailing some industrial use if required. The planned reduction in the amount of pumping that would be required for the S2GF would give the city more flexibility in how it manages available water resource to meet its customers' potable water demands.

The city's ongoing water quality monitoring program provides the necessary information to determine when and if a water treatment system would be necessary to protect its customers. In addition to this monitoring, the city's ability to draw from several wells would also allow considerable flexibility and lead time in addressing water quality problems. In the event a water treatment system were required, portable commercial systems are also readily available to meet short-term needs until a more permanent solution could be implemented.

To meet the additional groundwater extraction requirements imposed by operation of the S2GF, the city anticipates adding one or two additional wells within the May Road well field to maximize the city's water right. If the city elects to install these wells at greater depths than existing wells in this field, it may provide a buffer to protect against nitrate contamination since nitrates tend to be more concentrated in the shallower wells within the aquifer. This approach could provide a slightly different source of water, allowing more flexibility in mixing to reduce contaminant levels in the event that some of the wells become contaminated above the MCL.

To augment these measures during the operational life of the facility, SE2 has agreed to provide the city of Sumas with $25,000 per year to fund aquifer protection efforts and water rights acquisition. SE2 has also agreed to reimburse the city for the purchase and installation of a treatment system to remove nitrates from the potable water supply at any time during project operation if nitrate levels exceed any applicable federal, state, or local water quality criteria. However, considering the relatively high cost of operating such a system and disposing of the resultant residues, it is likely that the city would strive to achieve acceptable nitrate concentrations by mixing or obtaining other sources of water before installing a treatment system.

3.2.5 Significant Unavoidable Adverse Impacts

There are no significant unavoidable adverse environmental impacts that have been identified with respect to groundwater quality. Although nitrate concentrations may increase in the city's wells as a consequence of pumping required for the project, or might increase regardless but at a faster rate with S2GF, the water resource can be managed by the city of Sumas to mitigate potential impacts of such an increase.